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(54) Title: **CORYNEBACTERIUM GLUTAMICUM GENES ENCODING PROTEINS INVOLVED IN CARBON METABOLISM AND ENERGY PRODUCTION**

(57) Abstract: Isolated nucleic acid molecules, designated SMP nucleic acid molecules, which encode novel SMP proteins from *Corynebacterium glutamicum* are described. The invention also provides antisense nucleic acid molecules, recombinant expression vectors containing SMP nucleic acid molecules, and host cells into which the expression vectors have been introduced. The invention still further provides isolated SMP proteins, mutated SMP proteins, fusion proteins, antigenic peptides and methods for the improvement of production of a desired compound from *C. glutamicum* based on genetic engineering of SMP genes in this organism.

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/31 C12N15/55 C12N1/21 C12N9/18 C07K14/34
 C12P13/08 C12Q1/68 //(C12N15/55, C12R1:15)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12N C07K C12P C12Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, EMBL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PETERS-WENDISCH ET AL: "Pyruvate carboxylase as an anaplerotic enzyme in <i>Corynebacterium glutamicum</i> " MICROBIOLOGY, SOCIETY FOR GENERAL MICROBIOLOGY, READING, GB, vol. 143, no. PART 04, April 1997 (1997-04), pages 1095-1103, XP002110209 ISSN: 1350-0872 the whole document	1-3, 8-19, 22-34
X	EIKMANN ET AL: "The phosphoenolpyruvate carboxylase gene of <i>Corynebacterium glutamicum</i> : molecular cloning, nucleotide sequence, and expression" MOL. GEN. GENET., vol. 218, 1989, pages 330-339, XP002138580 the whole document	1-3, 8-19, 22-34
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☒ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

2 November 2000

Date of mailing of the international search report

08.02.01

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>DATABASE EMBL SEQUENCES [Online] Accession No. 006814, 1 November 1997 (1997-11-01) COLE S.T.: "6-phosphogluconolactolase (6PGL) of Mycobacterium tuberculosis" XP002151659 52% identity at the amino acid level (Seq. 2) and 60% at nucleotide level (seq. 1). & COLE S.T. ET AL.: "Deciphering the biology of Mycobacterium tuberculosis from the complete genome sequence" NATURE, vol. 393, 1998, pages 537-544, XP002151645 ---</p>	6-17,37, 38
A	<p>BATHE B. ET AL.: "A physical and genetic map of the Corynebacterium glutamicum ATCC13032 chromosome" MOL. GEN. GENET., vol. 252, 1996, pages 255-265, XP002151646 the whole document, in particular table 3. -----</p>	1-38

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 00/00943

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see subject 1. on extra sheet

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-38, partly

An isolated nucleic acid molecule from *Corynebacterium glutamicum* encoding an SMP protein or a portion thereof, said nucleic acid being characterized by seq. ID 1. An isolated nucleic acid comprising a nucleotide sequence at least 50% homologous to seq. 1. Corresponding polypeptides (seq. 2.). Corresponding vectors, recombinant host cells, production methods. Use in diagnosis of *C. diphtheriae*.

2-293. Claims 1-38, partly

Idem as subject-matter 1, but limited to the pairs of sequences listed in Table 1 (except those disclaimed).